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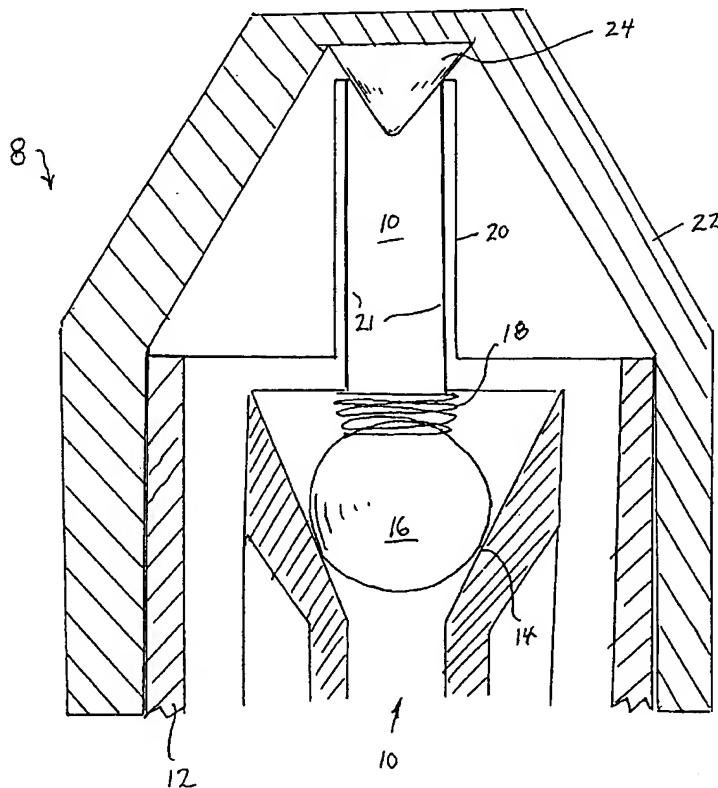
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ANTI-MICROBIAL DISPENSER

Technical Field

5 The invention relates to the field of liquid dispensers, particularly dispensers for dispensing sterile liquids such as medications.

Background Art

10 Medicaments such as asthma medication are often dispensed by aerosol spray or atomizers. However various liquids require sterile dispensing. Insulin, for example, must be dispensed in sterile form. In existing dispensing systems a container holds the liquid to be dispensed and a dispensing head is provided on the container
15 which has a dispensing channel connecting the interior of the container to the exterior air. Generally a pump of some kind is provided to allow the user to dispense the liquid. If the container is generally rigid, the upper region of the container must be kept at atmospheric pressure for the dispensing action to work, which means there will be
20 communication between the exterior atmosphere and the interior of the container, so that air uptake by the container can occur, giving rise to contamination of the liquid in the interior of the container.

Various approaches have been taken to maintain the interior liquid sterile in such dispensers. The present applicant's international
25 application PCT/CA99/01002 published May 4, 2000 discloses a device for dispensing a vaporized spray of sterile medicated liquid, comprising a housing for containing a supply of sterile medicated liquid, means for pressurizing the liquid, and a combination atomizing and pressure

release valve. The combination atomizing and pressure release valve comprises a layer of flexible material provided with an aperture, and a plug extending upwardly through the aperture and having a surface against which the layer of flexible material is biased in the closed 5 position, the layer lifting off the surface of the plug in the open position to thereby open the aperture.

Dual-valve air-uptake pumps have previously been attempted as a pumping member. In U.S. Pat. No. 2,815,890 discloses a dispensing assembly in which the dispensing head is mounted to rotate 10 with respect to the container to control the air uptake by the container. In that way, contact with the air by the liquid in the container, can be reduced and contamination prevented. In such an arrangement, however, after dispensing the liquid, some liquid remains in the dispensing channel and is in contact with air during the air uptake by the 15 dispensing head and during storage. The liquid in the dispensing channel may therefore be contaminated by impurities in the air and when the liquid is subsequently dispensed, will contaminate the freshly dispensed liquid from the container. United States Patent no. 5,492,252 provides for a flap valve to reduce contamination to liquid trapped 20 within the dispensing channel. While such a flap valve may reduce exposure of the liquid within the dispensing channel, it does little to reduce microbial contamination around the spout and flap valve itself. Microbial contamination would spread to the dispensing channel from the spout and flap valve. There is therefore a need for both a physical 25 and a chemical barrier to micro-organisms in dispensers for sterile liquids.

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The object of the present invention is to simultaneously provide both a physical and chemical barrier against microbial contamination in multi-purpose liquid dispensing devices.

5 Disclosure of Invention

The present invention provides a liquid-dispensing device in which the dispensed liquid is forced through a pressure release valve and in the course of doing so is brought into contact with a metallo-releasing agent. Such a metallo-releasing agent is selected from the group of boron, chromium, manganese, iron, cobalt, nickel, copper, zinc, rhodium, palladium, silver, tin, platinum and gold, and mixture and alloys of the foregoing.

15 Brief Description of Drawings

In drawings which disclose a preferred embodiment of the invention:

20 Fig. 1 is a cross-sectional view of a first embodiment of the invention;

Fig. 2 is a cross-sectional view of a second embodiment of the invention; and

Fig. 3 is a cross-sectional view of the embodiment of the invention shown in Fig. 2 with a removable cap.

Best Mode(s) For Carrying Out the Invention

With reference to the drawings, in Fig. 1 a liquid dispensing device 8 has a liquid dispensing channel 10 formed in the neck 12 of the dispenser 8, and communicates with the interior of the liquid-containing portion of the dispenser or a pump mechanism (not shown). A valve seat 14 is formed in the neck 12 and seats a ball valve 16 which is biased in a closed position by spring 18. The dispensing channel 10 extends through, at its end, a dispensing tube or spout 20 which is preferably lined on its interior surface 21 with silver. A removable cap 22 is provided which has a conical silver lid 24 which is forced into the end of, and in contact with, dispensing tube 20 when cap 22 is in place. To dispense the liquid, the dispensed liquid is forced into the dispensing channel 10 by squeezing the collapsible container, or actuating the pumping mechanism attached to the container. Pressure may alternately be supplied to the liquid by a source of compressed air attached to the liquid dispenser. The pressure of the liquid forces ball valve 16 off its seat and the liquid flows out the dispensing tube. When the pressure is removed, the ball valve 16 returns to its seat 14 and closes dispensing channel 10. Any liquid remaining on the interior of dispensing tube 20 is in contact with the silver lining 21. It is known that ions from the silver metal go into solution with the liquid, or alternately form hydrogen peroxide on the surface of the metal, to form an anti-microbial solution which is non-toxic in mild solution. When the cap is replaced, silver lid 24 forms another anti-microbial surface in contact with any liquid remaining in tube 20, so that any surplus liquid

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remaining in or adjacent tube 20 is maintained sterile while the device is not in use.

Fig. 2 illustrates an alternate embodiment in which the spout consists of hole 30 in a flexible (e.g. rubber) diaphragm 32. The 5 edge 34 of the diaphragm is secured by an insert 34 in neck 36: diaphragm 32 is stretched across, and bears tightly against, silver ball 38 which is fixed in seat 40 on valve support 41. Valve support 41 has a circular channel 42 through which liquid under pressure flows around ball 38 and out spout 30. To dispense the liquid in this embodiment, the 10 dispensed liquid is forced into the dispensing channel 42 by squeezing the collapsible container, or actuating the pumping mechanism attached to the container as above. The pressure of the liquid forces diaphragm 32 off ball 38 and the liquid flows out the spout 30. When the pressure is removed, the diaphragm 32 returns to its position against ball 38, 15 closing hole 30. Any liquid remaining in the interior of the valve adjacent ball 38 is in contact with the silver surface of ball 38 and remains sterile due to the anti-microbial effect of the silver as described above. The interior surface 33 of the diaphragm may be coated with the metallo-releasing agent instead of or in addition to having the agent on 20 the surface of ball 38.

Fig. 3 illustrates a removable cap 50 for the embodiment of the invention shown in Fig. 2. Secured to its lower surface 51 is a silver coated lid 52 which has a concave lower surface 53 to fit over, and contact the edges of hole 30 when the cap 50 is in place, thereby 25 maintaining sterile any liquid left in that area.

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It has been discovered that other metallo-releasing agents also work in substitution for silver. These include boron, chromium, manganese, iron, cobalt, nickel, copper, zinc, rhodium, palladium, tin, platinum, gold as well as silver, and mixtures of these, and alloys of 5 these elements.

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be 10 construed in accordance with the substance defined by the following claims.

WHAT IS CLAIMED IS:

1. In a device for dispensing a sterile liquid comprising a hollow housing for containing a supply of said sterile liquid, means for pressurizing said liquid, a dispensing spout having an aperture communicating with the exterior atmosphere, a dispensing channel communicating between said hollow housing and said dispensing spout and a pressure release valve for allowing liquid under pressure to flow through said dispensing channel and be dispensed through said spout, and stopping the flow of liquid when not under pressure, the improvement comprising providing a surface of metallo-releasing agent adjacent said aperture.
2. The improvement of claim 1 wherein said pressure release valve comprises a movable ball biased to block said dispensing channel when said liquid is not under pressure and opening said dispensing channel when said liquid is under pressure.
3. The improvement of claim 3 wherein said surface of metallo-releasing agent adjacent said aperture is provided on the interior surface of said dispensing channel downstream from said ball valve.
4. The improvement of claim 1 wherein said pressure release valve comprises a flexible diaphragm having a central aperture and biased against a curved surface mounted centrally to said dispensing channel, whereby said dispensing channel is blocked when said liquid is not under pressure and opened when said liquid is under pressure.

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5. The improvement of claim 4 wherein said surface of metallo-releasing agent adjacent said aperture is provided on said curved surface.
- 5 6. The improvement of claim 4 wherein said surface of metallo-releasing agent adjacent said aperture is provided on the interior surface of said flexible diaphragm.
7. The improvement of claim 6 wherein said curved surface is 10 a sphere.
8. The improvement of claim 4 wherein said metallo-releasing agent is selected from the group of silver, boron, chromium, manganese, iron, cobalt, nickel, copper, zinc, rhodium, palladium, 15 silver, tin, platinum and gold, and mixtures and alloys of the foregoing.
9. The improvement of claim 1 further comprising a removable cap having a spout-closing surface on the interior thereof, said spout-closing surface comprising a metallo-releasing agent. 20
10. The improvement of claim 1 wherein said metallo-releasing agent is selected from the group of silver, boron, chromium, manganese, iron, cobalt, nickel, copper, zinc, rhodium, palladium, silver, tin, platinum and gold, and mixtures and alloys of the foregoing.

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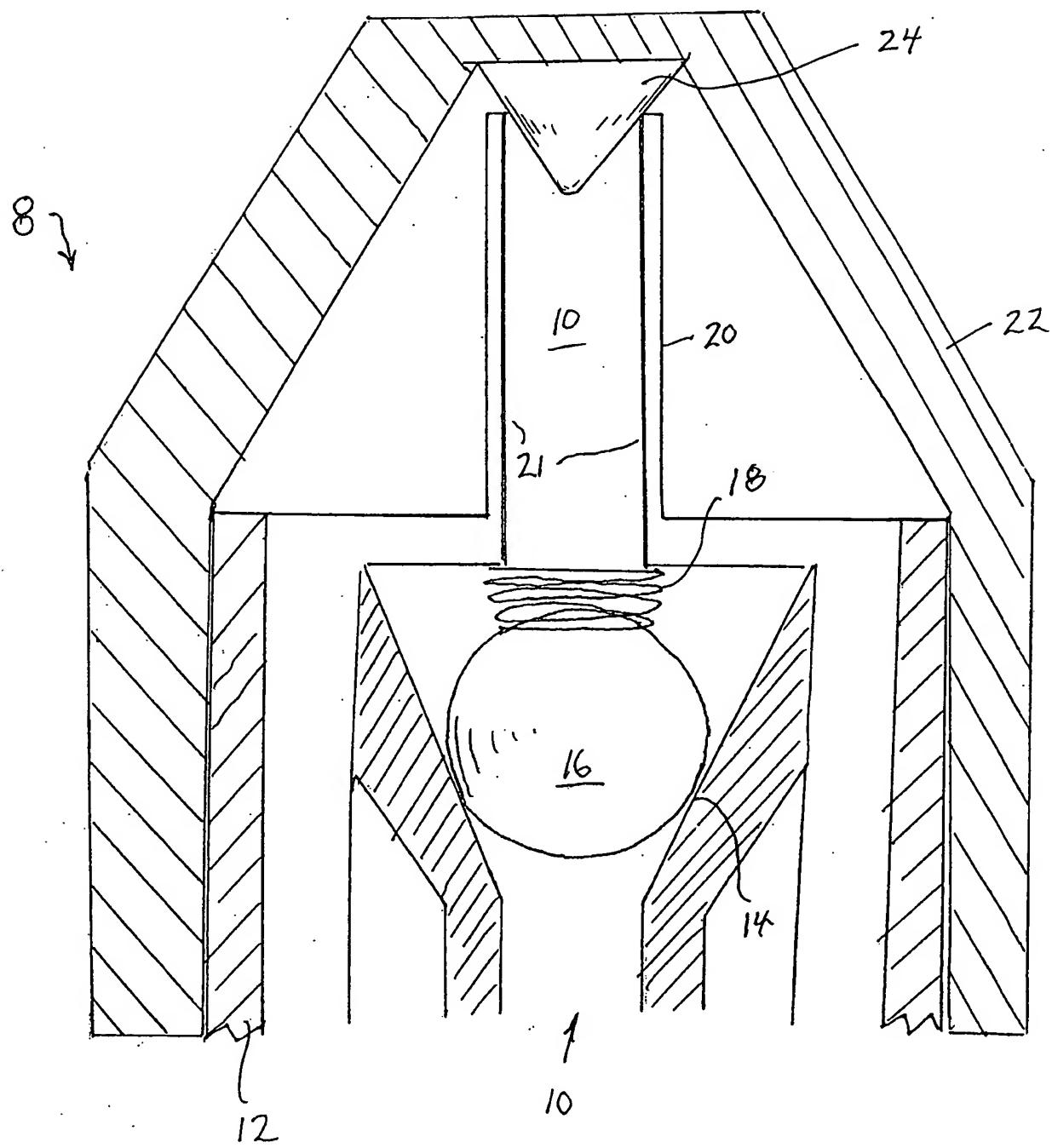


FIGURE 1

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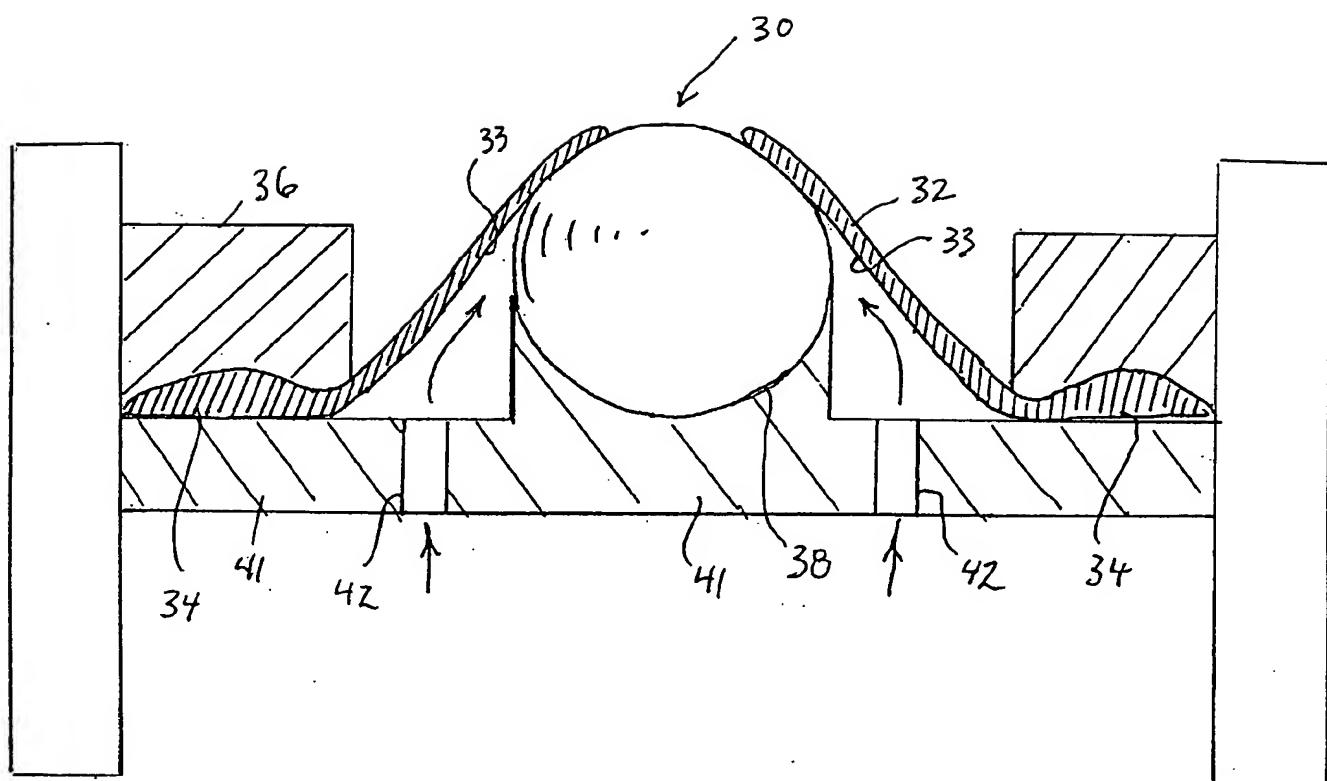


FIGURE 2

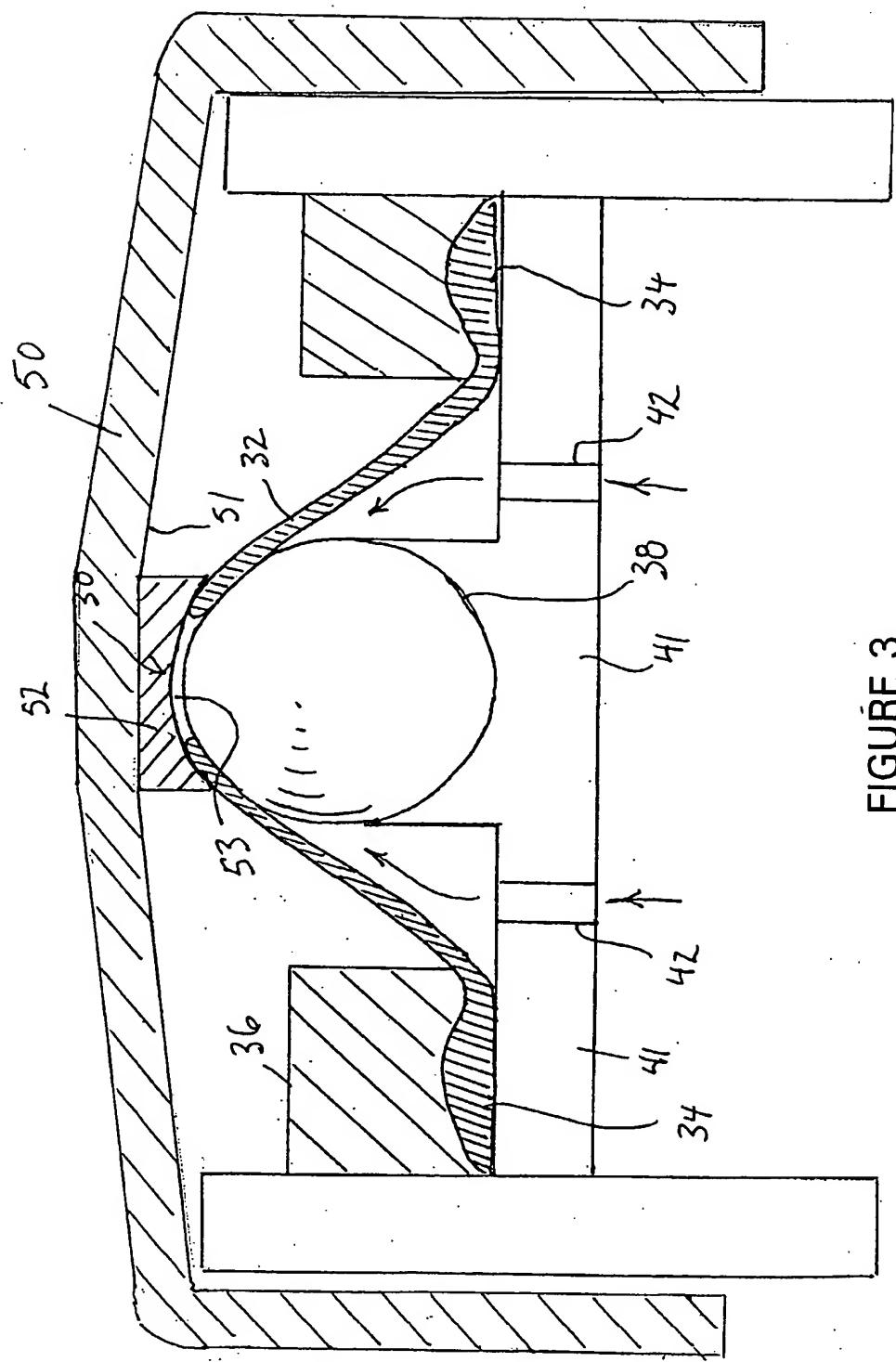


FIGURE 3

INTERNATIONAL SEARCH REPORT

Intell. application No
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A. CLASSIFICATION OF SUBJECT MATTER					
IPC 7	A61M11/00	A61M15/00	B05B11/00	B32B15/00	A61M5/168
	A61L2/00	A61L2/238	A61L2/232	A61M15/08	C08K3/00
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 360 145 A (GUERET JEAN-LOUIS H) 1 November 1994 (1994-11-01)	1-3, 10
Y	abstract; figures column 2, line 11 -column 3, line 68 column 4, line 26 -column 5, line 2 column 5, line 31-50 column 6, line 40-58 ---	4-9
Y	US 3 794 247 A (CORSETTE D) 26 February 1974 (1974-02-26) abstract; figures column 1, line 31-60 column 2, line 4-18 column 2, line 41 -column 6, line 44 ---	1, 4-10
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 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	abstract; figure 1 column 1, line 56 -column 2, line 24 column 2, line 28-31 column 2, line 45-51 column 3, line 45-52 column 4, line 11-17 ----	4-9
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